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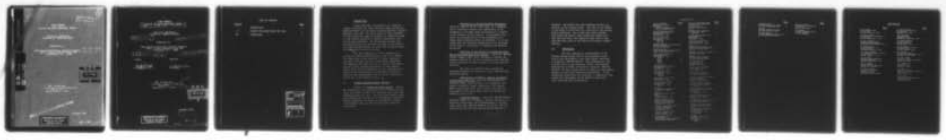

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FINAL REPORT:
BAFFLES AND NOISE REDUCTION, PHASE I

Report No. 078-FR-66
Contract No. N00014-66-C0048

Submitted to:

Naval Applications Group, Acoustic Programs
Office of Naval Research (Code 468)
Washington, D.C. 20360

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I INTRODUCTION

During 1966 TRG, Incorporated, has conducted studies of baffles and noise reduction under Contract No. N00014-66-C0048 with the Office of Naval Research, Acoustic Programs, Code 468. The small amount of money available for the studies has made it necessary to confine the work to some limited theoretical studies; experimental work has not been performed. The theoretical research conducted during the year has been reported in four technical notes released during the year; those technical notes are summarized in the next section.

The long-range goals of this program are to provide an improved understanding of the use of baffles and other means in the reduction of noise, especially self-noise affecting passive arrays aboard submarines. The immediate goal this year was to obtain a theoretical solution of the shielding properties of the simplest baffle which still incorporates the most important properties of the actual baffles encountered in practice. This goal was accomplished, and the results were described in one of the technical notes.

II REPORTS PUBLISHED DURING THE YEAR

Besides the Semiannual Status Report, report No. 078-SR-66-1, which summarized our activities for the first six months of 1966, four technical notes have been published during the year. The first two technical notes were prompted by a report by H.E. Ellingson of the Naval Ordnance Laboratory in which he discussed the effects of correlated noise; we did not quite agree with his conclusions.

Detection in a Correlated Noise Background, report No. TRG-078-TN-66-1 (May 1966), by V. Mangulis and H. Steinberg, examines the significance of the assumption of constant noise correlation as it applies to the analysis of real systems. In particular, the effect of correlated noise on the performance of a linear array receiving system is evaluated. It is concluded that the detection probability can be increased if the noise is correlated, as compared with uncorrelated noise.

Detection in the Presence of Correlated Noise Due to Stationary Near-Field Sources, report No. TRG-078-TN-66-2 (August 1966), by H. Steinberg, continues the analysis reported in the first technical note, with particular attention to noise sources in the near field of the array.

The last two technical notes examine the shielding properties of baffles for noise incident from behind the baffle.

Modification of PUFFS to Improve the Signal-to-Self-Noise Ratio (U), report No. TRG-078-TN-66-3 (November 1966), (Confidential), by V. Mangulis, proposes a relatively simple alteration in the present PUFFS installation which should improve the ratio of the signal to that noise which comes from behind the baffle by 10 to 15 db.

On Optimum Baffles, report No. TRG-078-TN-66-4 (November 1966), by V. Mangulis, contains the theory on which the calculations and recommendations in the previous report (No. TRG-078-TN-66-3) are based. The diffraction by infinite strip and half-plane baffles is

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examined. The baffles may have different acoustic reactances on the opposite sides. The field in the shadow of the baffle is calculated as a function of the acoustic baffle reactances. For a plane wave noise incident from behind the baffle, and a plane wave signal incident from the front, the signal-to-noise ratio is maximum when both sides of the baffle are pressure release surfaces.

III CONCLUSIONS

The most significant accomplishment of the program pursued during 1966 is the theoretical solution of the shielding by a non-rigid baffle, described in report No. TRG-078-TN-66-4. This mathematical solution has led to a very practical result, the proposed modification of PUFFS, described in report No. TRG-078-TN-66-3. In this latter report we outline an experimental program to verify the theoretical predictions. If the theoretical predictions are confirmed, a significant step towards the improvement of the signal-to-self-noise ratio will have been accomplished.

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